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Jason H. Eaton

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# Kicking the Habit: Russia's Addiction to Nuclear Waste Dumping at Sea

JASON H. EATON\*

## I. INTRODUCTION

The Russian Navy's nuclear experience is ending much as it began. The only difference is the scale of the damage inflicted on people and the environment. When the K-19 entered the Soviet fleet as its first nuclear-propelled ballistic missile submarine, the Soviet Union extolled the boat's technological advances.<sup>1</sup> The crew was rewarded with smoked fish, chocolates and cheeses, chow other sailors envied.<sup>2</sup> The perks soon were eclipsed, however, after a nuclear reactor cooling accident threatened to incinerate the ship.<sup>3</sup> Crewmembers sacrificed themselves to radiation in order to weld a new cooling system.<sup>4</sup> The ship made it back to Russia under tow. The crew was not so lucky.<sup>5</sup>

"Right on the spot their appearances began changing. Skin not protected by clothing began to redden, faces and hands began to swell. Dots of blood began to appear on their foreheads, under their hair. Within two hours, we couldn't recognize them," said Capt. Nikolai Zateyev. "People died fully conscious, in terrible pain. They couldn't speak, but they could whisper. They begged us to kill them."<sup>6</sup>

Of the twenty-two men killed, six were so radioactive that their corpses were entombed secretly in Moscow.<sup>7</sup> Their families were not notified.<sup>8</sup> The gear used to treat the crew at hospitals was destroyed.<sup>9</sup> And those delectables aboard the K-19 were put onto a

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\* Ensign, U.S. Naval Reserve, Judge Advocate General's Corps. B.A. 1992, University of Arizona; J.D. 1995 with certificate in environmental law, Lewis & Clark College Northwestern School of Law. The author wishes to thank Prof. James Bailey for his inspiration and comments on an earlier draft of this article. This article does not represent the views of the United States Navy or the Judge Advocate General's Corps.

1. Matt Bivens, *Horror of Soviet Sub's '61 Tragedy Told*, L.A. TIMES, Jan. 3, 1994, at A1.

2. *Id.*

3. *Id.*

4. *Id.*

5. *Id.*

6. *Id.*

7. *Id.*

8. *Id.*

9. *Id.*

barge along with clothing, equipment and the sailors' possessions.<sup>10</sup> That barge was moored off the Kola Peninsula with warning signs.<sup>11</sup> But the signs were ignored, and the barge was plundered for its valuables.<sup>12</sup> "Who knows what became of those [people] once they'd sampled the delicacies of that damned barge," Zateyev said.<sup>13</sup>

Equally unknown is the total damage that more than thirty years of Russian nuclear propulsion has inflicted upon the sea. Until the end of the Cold War and the disintegration of the Soviet Union,<sup>14</sup> information concerning nuclear propulsion was considered a state secret.<sup>15</sup> Residents of the USSR and surrounding countries were unable to determine the magnitude of nuclear propulsion production. Equally unknown was the number of accidents occurring at nuclear facilities or aboard ships. And while Russians are a technologically-advanced people, they lack a systematic approach to deal with their nuclear waste. Even if they had better nuclear waste safety measures, Russian citizens themselves lack the incentive to become involved in decisions concerning nuclear waste disposal.

This paper examines the amount of radiation released into the marine environment from Russia and its predecessor. Part II describes Russia's nuclear propulsion program and its dumping of nuclear waste at sea. Part III examines Russia's environmental laws and applicable international law. Part IV suggests three methods to improve the nuclear situation in Russia as it pertains to the sea. First, additional aid given to Russia should be tied to environmental assessments of the nuclear problem. Second, Russia should enact technology-forcing laws to reduce emissions on an "as practicable as possible" basis. Third, Russia should promote private land ownership as a means of encouraging environmental enforcement. Part V concludes that adoption of these recommendations would reduce the harm to the environment by breaking Russia's dependence on ocean dumping.

## II. THE LEGACY OF RUSSIA'S NUCLEAR PROPULSION PROGRAM

Russia's environmental destruction can be traced to Stalin's obsession with industrialization.<sup>16</sup> Stalin's five-year plans for agri-

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10. *Id.*

11. *Id.*

12. *Id.*

13. *Id.*

14. COMMONWEALTH OF INDEPENDENT STATES ACCORD, Dec. 8, 1991 (Rus. Legis.) 1991 WL 496610) (the USSR ceased to exist when Russia, Ukraine and Belarus signed the accord).

15. Kathleen M. Maloney-Dunn, *Russia's Nuclear Waste Law: A Response to the Legacy of Environmental Abuse in the Former Soviet Union*, 10 ARIZ. J. INT'L & COMP. L. 365, 385 (1993).

16. Peter M. Langrind, *An Overview of Environmental Law in the USSR*, 11 N.Y.L. SCH. J. INT'L & COMP. L. 483, 485 (1991) (Stalin's push for ever-greater

culture and industrial production paid no heed to environmental issues.<sup>17</sup> The Second World War generated greater emphasis on the industrial output needed to meet the demands of battle.<sup>18</sup> After the war, rather than reduce its industrial drive, the Soviet Union pressed for more industrialization. Production of more goods meant bonuses for workers; compliance with environmental laws yielded no such rewards.<sup>19</sup>

The rush to nuclear weapons and nuclear energy in the face of such lax environmental controls has been catastrophic. The creation of atomic destruction and power has led to the "creation of a problem of handling large quantities of radioactive waste, whose solution was never given special attention."<sup>20</sup>

#### A. *The Soviet Nuclear Propulsion Program*

Nuclear power plants are the ideal steam generator for submarines, and nuclear power's advantages over oil-fired plants were not lost on the Soviets. Nuclear reactors can be built smaller than oil-fired plants.<sup>21</sup> They don't need any air.<sup>22</sup> The concentration of energy on a weight and volume basis is greater than oil.<sup>23</sup> The nuclear reaction generates heat, which is used to boil water into steam.<sup>24</sup> The high-pressure steam pushes turbines, which generate electricity and turn the submarine's propeller.<sup>25</sup>

The Soviet Union's nuclear propulsion program began with the creation of a fleet of nuclear-powered icebreakers.<sup>26</sup> Quick to follow was a fleet of nuclear-powered attack submarines such as the K-19.<sup>27</sup> In addition, the Soviet Union produced a series of nuclear-propelled ballistic missile submarines carrying nuclear warheads.<sup>28</sup> Although the United States was the first nation to build a nuclear submarine,

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industry "created in the minds of the Soviet central planners a maniacal compulsion to increase industrial output that ran roughshod over environmental concerns").

17. *Id.*

18. *Id.*

19. Maloney-Dunn, *supra* note 15, at 386.

20. FACTS AND PROBLEMS RELATED TO THE DUMPING OF RADIOACTIVE WASTE IN THE SEAS SURROUNDING THE TERRITORY OF THE RUSSIAN FEDERATION § 2, GREENPEACE (Russian trans., Oct. 24, 1993) (materials from a government report on the dumping of radioactive waste, commissioned by the President of the Russian Federation) [hereinafter FACTS AND PROBLEMS]. A copy of the report is available in English from Greenpeace, 1436 U Street N.W., Washington, D.C. 20009.

21. TOM CLANCY, SUBMARINE 110 (1993).

22. *Id.*

23. *Id.*

24. *Id.*

25. *Id.*

26. FACTS AND PROBLEMS, *supra* note 20, at § 4.

27. *Id.* See generally, CLANCY, *supra* note 21, at 250.

28. *Id.*

the Soviet Union quickly caught up.<sup>29</sup> By 1990, the USSR had put 230 nuclear submarines to sea.<sup>30</sup> The U.S. had launched 170.<sup>31</sup>

Today, Russia possesses sixty percent of the world's nuclear reactors.<sup>32</sup> It has about 235 warships with nuclear power plants.<sup>33</sup> Another thirteen reactors are inside icebreakers operated by the Murmansk Shipping Company.<sup>34</sup> Russian submarines typically carry two nuclear reactors driving one screw.<sup>35</sup> Russian ballistic missile submarines also carry between eight and twenty-four intercontinental nuclear missiles.<sup>36</sup> The reactors within the Russian attack submarines use a liquid-metal cooling system, which while generating greater heat transfer, has made them difficult to cool and refuel.<sup>37</sup>

About 100 nuclear submarines await decommissioning.<sup>38</sup> By the year 2000, the Russians will add another eighty nuclear submarines to the backlog as arms control treaties take effect.<sup>39</sup> And even as old Russian submarines pile up at navy yards, the Russian government continues to invest in stealthier nuclear-propulsed submarines.<sup>40</sup> The nuclear race Russia so adamantly sought to win, however, is returning to haunt them as it becomes clear that Russia failed to consider what to do with the ships at the end of their life cycles.<sup>41</sup>

#### *B. Lack of Nuclear Waste Storage and Treatment Facilities*

When Russia built its submarines, they were completed "without a thought to the future."<sup>42</sup> Today the Russian Navy is being swallowed by nuclear waste. The operating navy's ships produce about 20,000 cubic meters of liquid radioactive waste and 6,000 tons of solid

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29. Joshua Handler, *No Sleep in the Deep for Russian Subs*, THE BULLETIN OF THE ATOMIC SCIENTISTS, Apr. 1993, at 7.

30. *Id.*

31. *Id.*

32. FACTS AND PROBLEMS, *supra* note 20, at § 4.

33. *Id.*

34. *Id.*

35. CLANCY, *supra* note 21, at 250-70 (A "screw" is navy parlance for "propeller").

36. *Id.*

37. CDR George R. Kraus, U.S.N.(Ret.), *Papa, Alpha, and Soviet Submarine Innovation*, PROCEEDINGS, Feb. 1994, at 88.

38. John J. Fialka, *U.S. Is Studying Ways to Help Russia Dispose of Aging Nuclear Submarines*, WALL ST. J., Apr. 2, 1993, at A5C.

39. Handler, *supra* note 29, at 7.

40. Rob Holzer, *How Far Under for Subs?*, NAVY TIMES, Oct. 17, 1994, at 42. Russia will launch the Papa-IX attack submarine in 2005. The submarine will rival the United State's new Seawolf (SSN-21). *Id.*

41. Norman Friedman, *World Naval Developments*, PROCEEDINGS, Oct. 1994, at 91-92 (Weapons-grade plutonium and uranium appear to be slipping through the Russia government's fingers as well. Western governments have uncovered several attempted sales of the material to Third-World countries).

42. Handler, *supra* note 29.

radioactive waste a year.<sup>43</sup> Of the thirty-five out-of-service submarines in the Pacific Fleet, only half have had their nuclear fuel removed.<sup>44</sup> The situation is worse in the Northern Fleet, where nuclear fuel has been removed from only a fourth of its forty-five retired submarines.<sup>45</sup> According to the Russian naval officer in charge of decommissioning Pacific Fleet boats, the fleet can process only one-and-one-half submarines a year.<sup>46</sup> At the current rate of decommissioning, it will take more than three decades to scrap old Pacific Fleet submarines.<sup>47</sup> And the Pacific Fleet is ahead of the Northern Fleet, which just initiated a program.<sup>48</sup> By the year 2000, Russia will have 300 nuclear reactors waiting to be scrapped.<sup>49</sup>

There is no room for the resulting nuclear waste. "Our storage facilities — two in the North and two in the Far East — are almost 100 percent filled and there's no place to put spent fuel," according to the admiral in charge of the Russian navy's maintenance.<sup>50</sup> A land-based nuclear storage facility will not be ready until the year 2000.<sup>51</sup>

The Northern Fleet is holding about 21,000 spent fuel assemblies in storage.<sup>52</sup> The Murmansk Shipping Company holds another 4,500 assemblies on three floating "technical bases" without room for additional fuel.<sup>53</sup> The Pacific Fleet has 8,400 spent fuel assemblies.<sup>54</sup> Additionally, three submarines with damaged reactors are stored pierside because their spent fuel cannot be off-loaded.<sup>55</sup>

The condition at the three floating bases is characterized as being in an "emergency" status because (for reasons unknown) the assemblies stored there are irrecoverable.<sup>56</sup> A Pacific Fleet nuclear-waste dump recently leaked radiation when snowmelt caused a floor to collapse, releasing radiation 1,000 times greater than the normal background radiation level.<sup>57</sup> The Pacific Fleet responded to the cri-

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43. *Id.*

44. *Id.* at 7.

45. *Id.*

46. *Id.*

47. *Id.* Some observers estimate the Russians will take 50 to 70 years to completely retire their submarines. See Viktor Kitovkin, *More Environmental Disasters Predicted for Russia: Safe Disposal of Scrapped Nuclear Ships Lag Due to Lack of Funds*, IZVESTIA, July 9, 1993, at 6.

48. Handler, *supra* note 29, at 7-8.

49. *Id.* at 7.

50. Kitovkin, *supra* note 47, at 6.

51. Handler, *supra* note 29, at 8.

52. FACTS AND PROBLEMS, *supra* note 20, at 26.

53. *Id.*

54. *Id.*

55. *Id.* (One of the submarines apparently suffered an explosion and fire pierside in 1985).

56. *Id.* at 27.

57. *Radioactivity Leaks at Russian Nuclear Waste Site*, Japan Economic

sis by building floating reactor holds.<sup>58</sup> By dismantling a submarine's outer hull and welding the reactor compartment to two adjoining compartments, the Russians have constructed floating holds.<sup>59</sup> These reactor holds then are towed to the nuclear submarine base at Vladivostok and tied to the pier.<sup>60</sup> The more typical response of the Russians has been to dump its nuclear waste at sea. This is the result of Russia's "unreadiness to develop" nuclear waste treatment and storage facilities.<sup>61</sup>

### C. *The History of Russia's Nuclear Waste Dumping*

Just as the United States was the first nation to develop a nuclear submarine, so too it was the first to dump nuclear materials at sea.<sup>62</sup> Russia's first nuclear-waste dumping in 1959 was tied to its testing of nuclear-powered submarines and the icebreaker *Lenin*.<sup>63</sup> In 1960, the USSR began the regular practice of dumping liquid radioactive waste, and in 1964, the dumping of solid radioactive waste, into Northern and Far Eastern oceans.<sup>64</sup> The Russian government estimates that it has dumped 24 kCi of liquid radioactive waste into the marine environment, primarily into the Barents Sea.<sup>65</sup> The Murmansk Shipping Company, builder of the icebreakers, stopped dumping liquid radioactive waste at sea in 1984.<sup>66</sup> The Russian Navy, however, continues to dump liquid radioactive waste at sea<sup>67</sup> because it lacks storage space and funds to build disposal facilities on land.<sup>68</sup>

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Newswire, June 29, 1994, available in LEXIS, World Library, JEN File. The fleet lacks the money to seal the breach and repairs have been postponed indefinitely. The Russian Navy refuses to allow civilian inspectors on its facility. *Id.*

58. Handler, *supra* note 29, at 8.

59. *Id.* By stripping the ship to its reactor, the Pacific Fleet saves 4.1 billion rubles (1990 value) if it avoids the cost of maintaining its submarines piersonside with their crews. *Id.*

60. *Id.*

61. FACTS AND PROBLEMS, *supra* note 20, at 25.

62. *Id.* at 3. The first dumping of radioactive waste at sea occurred in 1946 about 80 miles off the coast of California. Great Britain began dumping in 1949, followed by Japan in 1955. *Id.* The Soviet Union's first nuclear waste dumping at sea occurred in 1959 when it discarded 600 cubic meters of low-level radioactive waste. *Id.* at 10.

63. *Id.* at 10.

64. *Id.*

65. *Id.* at 11. This does not include radioactive leaking from on-shore facilities or nuclear submarine accidents. The Kara Sea received 8,500 Ci; the Barents Sea 12,153 Ci; the White Sea 100 Ci; and the Baltic Sea .2 Ci. *Id.*

66. *Id.*

67. *Id.* See also Fred Hiatt, *Russia Rethinks Nuclear Dumping*, WASH. POST, Oct. 21, 1993, at A22 (Russian navy backs down from plan to dump 800 tons of liquid radioactive waste after Japan protests the dumping of 900 tons of liquid radioactive waste into the Japan Sea.)

68. *Id.*

While it continues to dump liquid radioactive waste, the status of Russian dumping of solid radioactive waste at sea is uncertain. The Murmansk Shipping Company stopped dumping solid radioactive waste at sea in 1986.<sup>69</sup> The Russian Navy continued dumping solid radioactive waste at least until 1992.<sup>70</sup> There is no public information about the amount of solid nuclear waste the Russian government has disposed of at sea since 1992.

According to the Russian government, the greatest amount of solid radioactive waste was dumped between 1967 and 1982.<sup>71</sup> Most of this waste consisted of low- and medium-level radioactive waste generated during the operation of both surface ships and submarines.<sup>72</sup> The greatest environmental concerns stem from the disposal at sea of reactors, many with fuel still loaded. Off the coast of Novaya Zemlia, a northern Russian island, the government has placed:

- one submarine with two loaded reactors;
- a reactor section with two reactors loaded with spent fuel;
- a reactor section with one reactor with loaded spent fuel;
- one reactor without fuel;
- one submarine reactor with spent fuel; and
- one reactor assembly with a partial load of spent fuel.<sup>73</sup>

All the reactors with spent fuel except one were filled with a hardening mixture designed to prevent salt-water exposure to radioactive sources for up to 500 years.<sup>74</sup> Even so, the safety of the Russian measures are suspect. Witnesses to nuclear-waste dumping told the Russian government that at times the navy shot at the metal containers to speed their sinking.<sup>75</sup> In addition, the nuclear waste was not separated from other hazardous wastes before dumping.<sup>76</sup>

Not all the nuclear reactors dumped with fuel were intentional scuttles. In 1989, the submarine *Komsomolets* sank 300 miles off the

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69. FACTS AND PROBLEMS, *supra* note 20, at 12.

70. *Id.* at 16. In 1992, the Russian Navy dumped 2,741 cubic meters of solid radioactive waste into the Sea of Japan and off the coast of Kamchatka. The same year, the Russian Navy dumped 6,652 cubic meters of liquid radioactive waste. *Id.* at tbl. 9.

71. *Id.* at 12.

72. *Id.* at 11.

73. *Id.* at 12. The six submarine reactors were dumped with fuel in place because reactor accidents rendered the cores too hot to remove. The reactor assembly, from the icebreaker *Lenin*, was sunk for the same reason. *Id.*

74. *Id.* at 12-13.

75. *Id.* at 19. Solid radioactive waste was put into steel containers designed to corrode one millimeter each century. Because the containers used were so thin, radioactive material should reach the ocean within 10 years of dumping. *Id.* at 20.

76. *Id.* at 20.



Norwegian coast.<sup>77</sup> When the submarine hit the ocean floor at a depth of 5,525 feet, the submarine exploded and its titanium hull breached.<sup>78</sup> Two nuclear torpedoes on board were damaged as well.<sup>79</sup> Salt water is expected to reach the plutonium in the torpedoes within five to six years.<sup>80</sup> When the plutonium hits the water, it will meld with water particles and drift for tens of miles.<sup>81</sup> While the amount of plutonium that will be released is small in comparison to previous amounts of radioactivity introduced into the Arctic, the disintegration of a Russian nuclear hulk worries Norwegian fishers. "When the leaks start, no matter how small, no one will buy Norwegian fish."<sup>82</sup>

The *Komsomolets* is not alone on the ocean floor. Experts estimate it is joined by about fifty nuclear weapons.<sup>83</sup> Two United States nuclear submarines, the *Thresher* and the *Scorpion*, also lie on the ocean floor.<sup>84</sup> They are joined by Russian nuclear submarines lost off Cape Cod, northwest of Hawaii, southwest of the Azores, northwest of Spain, and northeast of Bermuda.<sup>85</sup>

#### D. Effects of Dumping on Ocean Ecosystems

Radiation in high doses can kill instantly, but scientists debate the effects of low level radioactive waste on people and the environment.<sup>86</sup> All life is subject to a continual shower of "background" radiation emanating from space and from within the earth.<sup>87</sup> The ques-

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77. Norman Polmar, *Campaigning for the Komsomolets*, PROCEEDINGS, Mar. 1994, at 76-77.

78. *Id.*

79. *Id.* The nuclear torpedoes carry 20 pounds of plutonium. In comparison, Arctic oceans have been exposed to between 450 and 650 pounds of plutonium already through nuclear weapons testing. *Id.*

80. *Id.*

81. *Id.*

82. *Id.* quoting Igor Spassky, designer of the *Komsomolets*.

83. *Id.*

84. *Id.* See also Robert Cooke, *The Nuclear Sea*, NEWSDAY, Jan. 11, 1994, at 55. The U.S. also lost two capsules carrying nuclear materials for bombs when a B-47 bomber carrying them was lost between Florida and Europe.

85. Cooke, *supra* note 84, at 55. The Russians have lost about 24 submarine-launched nuclear missiles and at least six nuclear torpedoes. *Id.* Not all man-introduced radiation has come from military operations. In 1964, radiation from a nuclear power generator aboard a satellite reentering the earth's atmosphere scattered plutonium across the earth's surface. P. Kilho Park, et.al., *Radioactive Wastes and the Oceans: An Overview*, in 3 RADIOACTIVE WASTES AND THE OCEAN 3, 22 (P. Kilho Park, ed. 1983).

86. NICHOLAS LENNSEN, NUCLEAR WASTE: THE PROBLEM THAT WON'T GO AWAY 16 (WORLDWATCH INSTITUTE) (Dec. 1991) [hereinafter WORLDWATCH].

87. *Id.* at 17. Radiation breaks the bonds holding molecules together, which leads to cell death or mutation. NATIONAL RESEARCH COUNCIL, HEALTH EFFECTS OF EXPOSURE TO LOW LEVELS OF IONIZING RADIATION 9, 65 (National Academy Press 1990).

tion is whether additional human-generated radiation, diluted by ocean water, is harmful.

Some studies suggest that marine organisms are less sensitive to radiation than people.<sup>88</sup> However, assessing the impact of radiation on marine life is difficult due to problems of accounting for the differing factors of source, dosage, and time exposed.<sup>89</sup> Additionally, scientists have difficulty determining how deep-sea ocean currents and sedimentation affect radioactive-waste dispersal and its subsequent intake by marine life.<sup>90</sup> The result is that while governments cannot "choose an abiotic dump site in the ocean," neither can they be sure how nuclear-waste dumping at sea will affect marine life or the food chain.<sup>91</sup>

Policymakers argue that until scientists agree on the effects of ocean dumping, such practices should be banned.<sup>92</sup> The Russian government, on the other hand, believes that "there is no danger to anyone . . . and, if no means of processing the radioactive waste on shore is found, life itself will force us to discharge it into the sea again."<sup>93</sup> Current studies appear to support Russia's position. A recent Russian-Japanese-South Korean scientific study of the Sea of Japan found radioactivity at dumping sites within normal background levels.<sup>94</sup> Another study of dump sites in the Kara Sea found that contamination was localized and not harmful to nearby areas.<sup>95</sup> Despite these

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88. Park, *supra* note 85, at 19.

89. *Id.* See also WORLDWATCH, *supra* note 86, at 16-17 (discussing differences between doses and period of exposure in assessing radiation effects on humans).

90. Park, et. al., *Requirements for Radioactive Waste Management in the Ocean*, in 3 RADIOACTIVE WASTES AND THE OCEAN, *supra* note 85, at 481, 497.

91. *Id.* at 503. Governments should study nuclear waste dumping at sea thoroughly lest they inadvertently "short-circuit[] otherwise remote links to man." *Id.* Non-scientific factors also weigh heavily in the argument, including the dependence of some nations on ocean resources, the costs and benefits of nuclear power, and the belief that the ocean requires special protection. Judith Spiller & Cynthia Hayden, *Radwaste at Sea: A New Era of Polarization or a New Basis for Consensus?*, 19 OCEAN DEV. & INT'L L. 345, 351 (1988).

92. *Nations Agree on Limits to Sea Dumping*, REUTERS WORLD SERVICE, Oct. 7, 1994, available in LEXIS, World Library, REUWLD file. ("If scientists cannot agree, it's better not to risk the marine environment," according to Dik Tromp, the chairman of the London Convention on Dumping.)

93. *Pacific Fleet Commander Denies Japanese Submarine Radiation Danger Story*, BBC SUMMARY OF WORLD BROADCASTS, Apr. 23, 1994, translating ITAR-TASS, 0136 GMT, Apr. 22, 1994, available in LEXIS, World Library, BBCSWB File (statement of Vice Admiral Georgiy Gurinov).

94. *Okean Expedition Find No Ecological Damage From Nuclear Waste Dumping*, BBC SUMMARY OF WORLD BROADCASTS, Apr. 29, 1994, translating Russian broadcast from Vladivostok, 0715 GMT, Apr. 20, 1994, available in LEXIS, World Library, BBCSWB File.

95. *Radioactive Contamination in Kara Sea Said to [Be] Localized*, BBC SUMMARY OF WORLD BROADCASTS, Oct. 7, 1994, translating ITAR-TASS, 1445 GMT, Sep. 22, 1994, available in LEXIS, World Library, BBCSWB File.

studies, only the Russians are willing to conclude the dumpings are not harmful. The United Nations is studying Russia's once-secret dumping grounds, including the area around the *Komsomolets*.<sup>96</sup> The North Atlantic Treaty Organization (NATO) is studying the effects of military-generated radioactive pollution.<sup>97</sup> Until science can provide answers to the unpredictability of nuclear-waste dumping at sea, prudence requires that governments create alternate means of handling such wastes.

### III. LEGAL REGIMES GOVERNING RUSSIAN NUCLEAR DUMPING

The dumping of nuclear waste at sea is governed by the London Convention on Dumping.<sup>98</sup> The Soviet Union was a signatory to the convention,<sup>99</sup> and Russia accepted the convention as part of its assumption of the USSR's obligations.<sup>100</sup> The convention prohibits the dumping of pollution into seas, other than internal waters.<sup>101</sup> The ban on pollution does not apply, however, to vessels with sovereign immunity,<sup>102</sup> such as warships, but the International Atomic Energy Agency (IAEA) requires that data on nuclear dumping be submitted regardless of the source.<sup>103</sup> Russia admits that its dumping was conducted in violation of the London Convention.<sup>104</sup> In addition, Russia is a signatory to the Convention for the Protection of the Marine Environment of the Baltic Sea Area,<sup>105</sup> which requires that Russia reduce Baltic Sea pollution. Russia also is a party to the Convention

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96. Thomas Land, *United Nations: UN to Study Seas Used for Nuclear Dumping*, REUTER TEXTLINE, May 28, 1994, available in LEXIS, World Library, TXTRAN File. The first foreigners to have access to the area off the Novaya Zemlya islands were Norwegians who began a joint study of the area with Russia in August, 1994. *Russia Opens Undersea Nuclear Waste Site to Foreign Inspection*, CHI. TRIB., Aug. 23, 1994, at 7.

97. Jean-Marie Cadiou, *The Environmental Legacy of the Cold War*, NATO REV., Oct. 1993, at 34. NATO currently is working on a study, *Cross-Border Environmental Problems Emanating from Defence-Related Installations and Activities*, which will focus on both chemical and radioactive pollution. *Id.*

98. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, Dec. 29, 1972, 26 U.S.T. 2403, 1046 U.N.T.S. 120, in NAGENDRA SINGH, INTERNATIONAL MARITIME LAW CONVENTIONS 2526 (1983).

99. *Id.* (the Convention came into effect for the USSR in 1976).

100. Commonwealth of Independent States Accord, *supra* note 14.

101. London Convention, art. I-IV. Art. I states that signatories "shall promote the effective control of all sources of pollution of the marine environment, and pledge themselves especially to take all practicable steps to prevent pollution of the sea . . . ." *Id.* Art. IV bans some dumping, and requires permits from the International Atomic Energy Agency (IAEA) for dumping of radioactive wastes. London Convention, art. IV.

102. London Convention, art. VII.

103. FACTS AND PROBLEMS, *supra* note 20, at 2.

104. *Id.* at 10.

105. Convention for the Protection of the Marine Environment of the Baltic Sea Area, 13 I.L.M. 544 (1974).

on the Protection of the Black Sea Against Pollution,<sup>106</sup> which bans radioactive waste dumping in the Black Sea.<sup>107</sup>

Furthermore, there is no lack of Russian environmental law. By 1987, the USSR had passed more than 1,000 environmental laws.<sup>108</sup> However, these laws were ineffective because they contained no enforcement means and were generally ignored.<sup>109</sup> The Russian Navy dumped radioactive waste at sea despite its own regulations and the regulations of other agencies prohibiting such dumping.<sup>110</sup> The Russian Navy benefited from a hole in the nation's environmental laws, which failed to address nuclear hazards.<sup>111</sup> The Russian parliament has passed a bill limiting nuclear waste disposal.<sup>112</sup> Overall, however, the Russian environmental law system has "exerted very little influence over Soviet industrial practices or military policies to date."<sup>113</sup>

Recent Russian law, however, is different from its predecessor's in many ways. The Russian Constitution includes three articles relating to the environment. The first, article 9, states that land is the "basis of the life and activity of the peoples."<sup>114</sup> In addition, every Russian "has the right to a decent environment, reliable information about the state of the environment" and payment for personal or property damage because of ecological harms.<sup>115</sup> Finally, the Russian Constitution states that every citizen is "obliged to protect nature and the environment and to show solicitude for natural wealth."<sup>116</sup> In

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106. Convention on the Protection of the Black Sea Against Pollution, 32 I.L.M. 1101 (1993).

107. *Id.*

108. *Environmental Law and Policy in the USSR*, 17 ENV'TL L. REP. (Env'tl L. Inst.) 10,068 (Mar. 1987).

109. *Id.*

110. FACTS AND PROBLEMS, *supra* note 20, at 9.

111. Maloney-Dunn, *supra* note 15, at 379.

112. *Russia Passes Bill to Limit Nuclear Waste Disposal*, Japan Economic Newswire, July 7, 1994, available in LEXIS, World Library, JEN File. The bill, passed July 7, 1994, is Russia's first comprehensive nuclear waste law. The law bans dumping liquid nuclear waste beneath the earth's surface and in waterways. The government does, however, continue to assert its exemption to the international ban on nuclear waste dumping at sea. The law also limits the release of information about nuclear waste dumping. *Id.*

113. *Id.* Despite the lack of facilities or laws to adequately handle the nuclear waste dilemma, Russia has engaged in negotiations to receive Western nations' hazardous waste. The Swiss nuclear power industry admitted to such negotiations in September, 1994 after Greenpeace leaked a secret memorandum to the press. The Swiss plan calls for shipping nuclear waste to a yet-to-be-completed nuclear recycling plant. *Swiss Nuclear Power Industry Admits to Talks on Shipping Toxic Wastes to Russia*, INT'L. ENVTL. DAILY, Sept. 21, 1994, available in WESTLAW, BNA-IED file.

114. RUSSIAN FEDERATION CONST., art. 9, cl. 1 (Dec. 12, 1993).

115. *Id.* at art. 42.

116. *Id.* at art. 58.

contrast, the USSR Constitution only provided for the protection of the environment for future consumptive use.<sup>117</sup>

In addition to including the environment in its constitution, Russia passed an environmental law in 1992 defining the rights of citizens with regard to the environment.<sup>118</sup> The law also bans the importation and disposal of nuclear waste.<sup>119</sup> Citizens are given the right to sue polluters,<sup>120</sup> and to demand closure of polluters for non-compliance.<sup>121</sup> Despite these legal regimes, Russia has not yet been able to deal effectively with its nuclear waste dilemma. A lack of information regarding environmental degradation, the absence of a comprehensive nuclear waste handling policy, and the need for better use of land-ownership rights all have kept Russia hooked on dumping at sea.

#### IV. KICKING RUSSIA OF THE NUCLEAR DUMPING HABIT

Russia has not been the only country that dumped nuclear waste at sea. Cold War-era nuclear activities by both sides have caused "such formidable damage to the environment, to human health and perhaps even to the human genotype, that the consequences will be felt for decades."<sup>122</sup> Even so, several nuclear-capable powers still remain drawn to the concept of the seas as the great diluter of nuclear pollution. Great Britain, France, China, and Belgium had objected to a proposal to ban all nuclear dumping at sea until recently.<sup>123</sup> Great Britain said that while it believed that controlled dumping presented no threat to the environment or human health, it would comply.<sup>124</sup> Russia remains the only holdout.<sup>125</sup>

##### *A. Use of Trade to Encourage Responsible Nuclear Waste Treatment*

When the issues of trade and the environment are mentioned in the same breath, the conversation inevitably turns to sustainable

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117. USSR CONST., art. 18. (1977), in *THE SOVIET UNION THROUGH ITS LAWS* 29 (Leo Hecht ed., 1983) ("In the interest of future generations, necessary steps are to be taken in the USSR to protect and to make rational use of the land and its mineral and water resources . . .").

118. RSFSR LAW ON ENVIRONMENTAL PROTECTION (1992) *translated by* FBIS, JPRS-TEN-92-007 (Apr. 28, 1992).

119. *Id.* at art. 50(3).

120. *Id.* at art. 12.

121. *Id.* at art. 91.

122. Jean-Marie Cadiou, *The Environmental Legacy of the Cold War*, NATO REV., Oct. 1993, at 33. The concern over transboundary movements of hazardous and nuclear wastes has spurred the military alliance to start 30 studies concerning waste disposal. *Id.* at 34.

123. *Radioactive Waste: Ban on Ocean Dumping Accepted by U.K.*, 33 DAILY ENV'T REPORT (BNA) d4, Feb. 18, 1994.

124. *Id.*

125. *Id.*

development. As a concept, sustainable development is defined as "an economic development approach that allows for growth and satisfies basic human needs while avoiding profligate resource exploitation and pollution."<sup>126</sup> The reality of sustainable development is more problematic, since it has yet to be achieved.<sup>127</sup> But it is a useful guiding concept for Western countries when determining which projects they will fund abroad, and for spurring environmental awareness.

Russia has made many trips to Western coffers — to the tune of \$82.9 billion at the end of 1993.<sup>128</sup> The majority of its loans comes from Western governments.<sup>129</sup> Additional assistance arrives in the form of monetary aid from multilateral financing institutions such as the World Bank and the International Monetary Fund. The money Russia receives is desperately needed and it barely helps. Russia had been counting on money pledged by Western nations to fund critical areas of its budget and thereby reduce inflation.<sup>130</sup> But of the \$24 billion pledged in 1992 and the \$28 billion offered in 1993, only \$4 billion has reached Russia.<sup>131</sup> When Western nations have come through with money, it often is tied to bettering the Russian economy for Western business or is earmarked for specific projects.<sup>132</sup>

Currently, Russia is waiting for \$1.5 billion in International Monetary Funds to be released for use in its foreign exchange and for "general financing."<sup>133</sup> The World Bank recently made a \$300 million loan to improve 7,200 miles of Russian roads.<sup>134</sup> Western countries also have arranged for a \$6 billion currency stabilization fund and \$10 billion in export credits.<sup>135</sup> Money for environmental projects in

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126. Marvin S. Soroos, *From Stockholm to Rio: The Evolution of Global Environmental Governance*, in ENVIRONMENTAL POLICY IN THE 1990S 299, 310 (Norman J. Vig & Michael E. Kraft eds., 2d ed. 1994).

127. Margaret Bowman & David Hunter, *Environmental Reforms in Post-Communist Central Europe: From High Hopes to Hard Reality*, 13 MICH. J. INT'L L. 923, 975 (1992).

128. Kenneth N. Gilpin, *Mopping Up Foreign Debt*, N.Y. TIMES, Apr. 18, 1994, at C1, C5.

129. *Id.* (Russia owes 25 percent of the \$82.9 billion debt to commercial banks, the rest to Western governments.).

130. Jeffrey Sachs, *Reformers in Retreat: Indecision Costing West its Chance to Rescue Russia*, ROCKY MTN. NEWS, Feb. 6, 1994, at 83A. Mr. Sachs is a well-known international trade professor at Harvard University who was an adviser to the Russian government. By paying for part of the budget, Western nations could reduce the amount of money the Russian government was printing, and reduce inflation. That, in turn, would have freed more money for social programs. *Id.*

131. *Id.*

132. See Bowman & Hunter, *supra* note 127, at 976.

133. *International Finance: Camdessus Estimates Russia Loan Will Be Approved Around May 1*, 11 INT'L TRADE REP. (BNA) 13, Mar. 30, 1994. The IMF loan has been conditioned on Russia tightening its budget and enacting other reforms. *Id.*

134. *Russia Borrows \$300M for Roads*, BOSTON GLOBE, Feb. 18, 1994, at 6.

135. *International Finance: Group of Seven Warns Russia About Need for Economic Reforms*, 11 INT'L TRADE REP. (BNA) 9, Mar. 2, 1994.

Russia thus far has been limited to paying for the dismantlement of nuclear missiles. The United States is paying \$1.2 billion over three years toward nuclear-warhead destruction.<sup>136</sup> According to the Department of State, the United States would like to offer more for the environment, but is limited by its own resources.<sup>137</sup>

Even if the Western world cannot generate the billions of rubles needed to fund the building of a nuclear waste storage and treatment facility, it can use its money to promote environmental awareness. One of the key problems with nuclear dumping at sea and with environmental problems in Russia generally is the lack of information in the hands of its citizens and the rest of the world.<sup>138</sup> Russia has no law similar to America's Right-to-Know Act.<sup>139</sup> Nor does Russia have a law comparable to the United States' National Environmental Policy Act (NEPA).<sup>140</sup> NEPA's environmental impact statements (EISs) are required to include the environmental impact of any proposed federal action and any alternatives.<sup>141</sup> NEPA EISs are then made available to anyone who wants them.<sup>142</sup> This has the effect of "enrich[ing] the understanding of the ecological systems and natural resources important to the Nation."<sup>143</sup> In contrast, Russian officials have sought to limit the flow of information to the public.<sup>144</sup> Thus, Russians are without laws that ensure their access to information about the effect of government actions on the environment. Without independent sources of information, Russians are likely to continue to receive inaccurate information about nuclear-waste dumping.<sup>145</sup> Accurate

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136. James E. Goodby, *Averting Nuclear Chaos: The Tasks Before Us*, 4 DEP'T ST. DISP. (Oct. 11, 1993).

137. *Id.* See also Handler, *supra* note 29, at 9. The U.S. Navy is midway through a \$2.7 billion effort to decommission about 100 nuclear submarines by the year 2000.

138. See Maloney-Dunn, *supra* note 15, at 429. See also David A. Colson, *Russia's Radioactive Waste Disposal: A Matter of Grave Concern*, 4 DEP'T ST. DISP. 47 (Nov. 22, 1993). ("The international community was deliberately misled by the USSR. Those responsible did no credit to themselves, and they did a disservice to the marine environment, the international community and its institutions, their country, and its people.")

139. Emergency Planning and Community Right-to-Know Act of 1986, 42 U.S.C. §§ 11001-11050 (1988).

140. National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4370(d) (1988). NEPA requires an environmental impact statement for every "major Federal action significantly affecting the quality of the human environment . . . ." 42 U.S.C. § 4332(C).

141. 42 U.S.C. § 4332(C)(i-iii).

142. 42 U.S.C. § 4332(G).

143. 42 U.S.C. § 4321.

144. See, *Russia Passes Bill to Limit Nuclear Waste Disposal*, Japan Economic Newswire, July 7, 1994, available in LEXIS, World Library, JEN File.

145. For instance, one newspaper recently wrote that the Russian government stopped nuclear-waste dumping at sea in 1991 and that some of the most hazardous waste dumped near the Novaya Zemlya islands in the Arctic Oceans was "not

information, however, would put Russian citizens in a better position to pressure governments and change their own polluting behavior.<sup>146</sup> With restructuring, Western aid could provide some of that information.

The World Bank has a process similar to NEPA through which it prepares environmental assessments (EAs).<sup>147</sup> The primary goal of an EA, however, is to "help reduce the risk of cost overruns and delays . . . as a result of unanticipated environmental disruptions."<sup>148</sup> Thus, the World Bank's environmental-assessment process is less concerned with examining alternatives and getting information to people than it is with ensuring that its funds are not depleted by dealings with unforeseen environmental factors. This makes the assessment process nearly valueless for the country receiving the aid. As Congress made clear when it debated NEPA, "our . . . present state of knowledge, our established public policies, and our existing governmental institutions are not adequate to deal with the growing environmental problems and crises the Nation faces."<sup>149</sup> The assessment procedure does little to further knowledge when the information it generates is tailored for funding purposes.

America's NEPA is inadequate to cover the responsibility of providing environmental assessment information to foreign residents. Thus far, the Supreme Court has refused to apply environmental laws abroad because plaintiffs lack standing.<sup>150</sup> Therefore, application of NEPA abroad is not an option for people wanting information on U.S.-sponsored activities. Practically, the people most in need of the information lack the resources to bring a NEPA enforcement suit anyway. NEPA may not apply to multilateral financing institutions because they are not "federal," even though the United States may provide most of their capital. American environmental laws therefore fail to provide a meaningful environmental assessment device for residents of foreign countries.

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very harmful." Vladimir Lagovsky, *Lenin's Heart Beats on the Sea Bottom*, RABOCHAYA TRIBUNA, May 18, 1994, at 1, 4 translated by Russian Press Digest available in LEXIS, World Library, SPD File.

146. WORLD DEVELOPMENT REPORT 1992: DEVELOPMENT AND THE ENVIRONMENT 87 published for the WORLD BANK by Oxford Univ. Press (1992). Information also tends to encourage a more rational environmental debate. *Id.*

147. *Id.* at 81.

148. *Id.*

149. *Defenders of Wildlife v. Andrus*, 627 F.2d 1238, 1243 (D.C. Cir. 1980) quoting S. REP. NO. 91-296, 91st Cong., 1st Sess 4 (1969).

150. *Lujan v. Defenders of Wildlife*, 112 S.Ct. 2130 (1991). While not deciding on the issue of extraterritoriality, the Supreme Court found that the plaintiffs lacked standing to challenge a Department of Interior rule stating that the Endangered Species Act of 1973, 16 U.S.C. §§ 1531-1544 (1988), did not apply abroad. *Id.*



On the other hand, the present World Bank structure offers a good foundation. The United States has pressured multilateral development banks to promote sustainable development and require environmental assessments by forbidding American directors within these institutions to vote for any bank action that would significantly affect the environment.<sup>151</sup> Additionally, the U.S. law contemplates that the results be given to "affected groups and local nongovernmental organizations."<sup>152</sup> The United States should continue, however, to press for more meaningful assessments.

First, as under America's NEPA, the multilateral development banks should be required to focus their assessments on alternatives to a proposed project. The alternatives should strive to meet the goals of sustainable development. Providing alternatives ensures that policymakers will have thought through the proposed project's impact.<sup>153</sup> Additionally, alternatives give local leaders a choice of options in deciding whether to accept a bank's project or to protest it. Local constituents are in the best position, by virtue of their historical link with a specific location, to approve of a project and to determine how it should be constructed. They have a greater environmental stake in projects; therefore, they should be aware of all alternatives before supporting new construction.

The alternatives data are useless, however, unless locals receive the assessment information. To ensure that they do, Western countries should use the United Nations as a clearinghouse. The U.N. is ideally suited to handle the passing-down of information because it is globally known and has offices worldwide. The multilateral development banks, in conjunction with Western governments and the governments receiving assistance, should establish and fund environmental information centers. These centers could be run through U.N. relief offices, U.N. development offices or the facilities of the multilateral banks and Western governments themselves. The multilateral banks would be required, before receiving additional capital from the West, to send their environmental assessments to the centers via the U.N. The assessments should be provided free of charge to local governments, media and citizens in their native languages. Local citizens should be encouraged to pick up copies of assessments. This would provide a concrete means of better educating local groups about Western funding projects and the environment in general. Such information would encourage interaction between the banks, government, and citizens. This would, in turn, enable policymakers to better under-

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151. International Development and Finance Act of 1989, 22 U.S.C. § 262m-7 (Supp. IV 1992) (A director may vote in favor of a project having a significant environmental effect if an assessment has been completed and provided to affected groups.).

152. 22 U.S.C. § 262m-7(a)(1)(B) (Supp. IV 1992).

153. *Defenders of Wildlife*, 627 F.2d at 1243.

stand local situations and make decisions that more reasonably reflect the policy of sustainable development.

Generating information is the best way to use trade to help alleviate the environmental problems associated with nuclear-waste dumping at sea absent agreement among Western nations to build a nuclear waste storage and treatment facility. Using other trade policies to solve the problem would not be effective, since trade in general has only an indirect effect on nuclear waste production. Russia's nuclear waste dilemma is a creature of military design, not one resulting from the rampant use of natural resources to generate trade. Additionally, the use of trade policies themselves are a "blunt and uncertain tool" for environmental governance because the environment often can be harmed more by trade policies designed to prevent ecological problems.<sup>154</sup> If Western governments are going to push their belief that trade is an environmental issue,<sup>155</sup> they should provide developing countries with the information about Western projects needed to meaningfully assess the ecological impacts. Once empowered with information about the environment, local governments and citizens are less likely to tolerate acts such as Russia's nuclear-waste dumping, and pressure policymakers to halt such environmentally degrading practices. "That debate — sure to be vigorous — should be viewed as an opportunity for dialogue and progress, rather than as a threat to any particular economic system or order."<sup>156</sup> The value of information becomes greater when viewed as a tool to overcome social behavior that is environmentally damaging.<sup>157</sup> As a method of fostering better environmental practices through trade, information via environmental assessments is the best service the West could provide to developing countries. The use of other trade-based policies, such as sanctions, would not have as positive and direct an impact as the release of information would. Western nations should use their influence to stimulate the worldwide flow of information about the environment. A simple means to accomplish this is through an expanded environmental assessment program.

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154. WORLD DEVELOPMENT REPORT 1992, *supra* note 146, 67. See generally ROBERT V. PERCIVAL, ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 1190 (1992).

155. Alan Riding, *Gore Insists Environment is a Trade Issue*, N.Y. TIMES, Apr. 15, 1994, at C1.

156. Scott McCallum, *Local Action in a New World Order*, 23 ENVTL. L. 621, 631 (1993).

157. Norman J. Vig & Michael E. Kraft, *Conclusion: The New Environmental Agenda*, in ENVIRONMENTAL POLICY IN THE 1990S, *supra* note 126, at 369-70.

*B. Using Technology-Forcing Laws to Spur Better Environmental Practices*

Regulation of environmental problems manifests itself in two basic schemes. First, regulators can use health-based approaches which seek to reduce the amount of harm to people by requiring industry to meet certain emissions levels.<sup>158</sup> The other method of regulation depends on the level of technology available to the entity regulated.<sup>159</sup> This second approach, when combined with a "technology-forcing" scheme,<sup>160</sup> offers the best solution to putting Russia on a system of nuclear waste control.

A health-based regulatory scheme for nuclear waste is unworkable because of disagreement over the harmfulness of radioactive waste dumping at sea.<sup>161</sup> The Russian government has reached a "preliminary conclusion" that the dumping of liquid radioactive waste poses no danger to the general populace or to people who live in coastal areas or work the seas.<sup>162</sup> The Russians cannot, however, determine the threat to the human environment from the dumped solid radioactive wastes.<sup>163</sup> Scientists still believe information is needed regarding at-sea radioactive waste disposal, including how biota uptake radionuclides.<sup>164</sup> Without more concrete data, it is impossible to calculate meaningful health-based standards since there is no indication, one way or another, exactly how nuclear waste dumping at sea affects people or the marine environment.

Ideally, a nuclear-waste management scheme has two parts. First, the waste must be classified and evaluated.<sup>165</sup> This process allows the generator to know what it is dealing with and what storage conditions and treatments are appropriate.<sup>166</sup> The generator iden-

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158. See generally PERCIVAL, *supra* note 154, at 146-53.

159. *Id.*

160. *Id.* at 165-68. "Technology-forcing" is the imposition of standards more stringent than those attainable by then-available technology to compel polluters to come up with innovative solutions. *Id.* at 167.

161. *Radioactive Waste: Ban on Ocean Dumping Accepted by U.K.*, *supra* note 123.

162. FACTS AND PROBLEMS, *supra* note 20, at 18.

163. *Id.* at 20.

164. Park, *Requirements for Radioactive Waste Management in the Ocean*, in 3 RADIOACTIVE WASTES AND THE OCEAN, *supra* note 85, at 481, 482. (Information should be gathered on the behavior of radioactive wastes in saltwater and sediments, biological uptake and effects of radiation.).

165. INT'L ATOMIC ENERGY AGENCY WASTE MANAGEMENT SECTION, DIVISION OF NUCLEAR FUEL CYCLE, TECHNICAL PAPER IN SUPPORT OF THE CODE OF PRACTICE ON TRANSBOUNDARY SHIPMENTS OF NUCLEAR WASTES (Apr. 1989), *reprinted in* TRANSBOUNDARY MOVEMENTS AND DISPOSAL OF HAZARDOUS WASTES IN INTERNATIONAL LAW 374, 378 (Barbara Kwiatkowska & Alfred Soons eds., 1993) [hereinafter TRANSBOUNDARY HAZARDOUS WASTES].

166. *Id.*

tifies the best storage and treatment options as the next step.<sup>167</sup> It then implements procedures to ensure the safe daily operation of nuclear waste facilities undertaking these chores.<sup>168</sup> The chief international adviser for countries implementing nuclear programs is the International Atomic Energy Agency (IAEA).<sup>169</sup>

Russia apparently has a method of determining what wastes are low, medium and high level radioactive. Until recently, however, no attempt had been made to quantify the amount of nuclear waste Russia was generating or how it was dealing with such waste.<sup>170</sup> A lack of record-keeping has required a post-hoc expert-generated "best guess."<sup>171</sup> The chore of finding storage methods has been left to various fleet commanders, apparently without any systematic evaluation or coordination. Nor is there apparently any type of inspection or auditing of nuclear-waste storage in the fleets beyond the basic identification of radioactive levels.<sup>172</sup> Such a disjointed scheme for nuclear-waste management suggests that Russia needs to adopt systemic regulations that put the bureaucracy on a technology-forcing program.<sup>173</sup>

The Russian technology-control program should be implemented in three phases. Each phase would lead to greater restrictions on nuclear waste releases into the environment. The three phases are:

- (1) Best Practicable Technology;
- (2) Best Available Technology; and
- (3) Lowest Achievable Emission Rate.

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167. *Id.* (Looking at the storage and treatment options entails conducting engineering and feasibility studies, safety assessments, environmental impact statements.).

168. *Id.* at 379-80 (Safety concerns encompass employee training, record-keeping, quality assurance programs, and independent oversight by inspections and audits).

169. "The General Conference . . . calls upon the [IAEA] to give priority consideration to requests by developing countries for assistance in the field of nuclear waste management." INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA), RESOLUTION OF THE IAEA GENERAL CONFERENCE ON DUMPING OF NUCLEAR WASTES (Sept. 23, 1988), *reprinted in* TRANSBOUNDARY HAZARDOUS WASTES, *supra* note 165, at 355, 356.

170. FACTS AND PROBLEMS, *supra* note 20, at i.

171. *Id.*

172. *Id.* at 10 ("The evaluation of radioecological consequences of dumping [radioactive waste] on the basis of the information provided . . . is quite problematic due to the lack of detailed information on the radionucleic content of the waste and the protective qualities of the containers").

173. Maloney-Dunn, *supra* note 15, at 368-369. Russia has been debating a new nuclear-waste law, but it has yet to be passed. The law would supplement the current environmental law banning the foreign import of nuclear waste by forbidding the burial of foreign nuclear waste on Russian soil. It does not, however, implement any procedures for dealing with current waste problems.

The most important factor to remember about each of the technology levels is that they are temporary. Under the U.S. Clean Water Act, for example, Congress envisioned Best Practicable Technology applying for no more than three years.<sup>174</sup> No matter what level the polluters obtain, it would be up to the Russian government to revisit the technology controls and adjust them as necessary. Under the Clean Water Act, the EPA must review effluent limitations every five years and make adjustments as necessary.<sup>175</sup> The result is that the technology is always ratcheted toward greater limits on pollution.

### 1. Best Practicable Control Technology

Best Practicable Control Technology (BPT) is the low point of technological-based controls. BPT is designed to be the entry point in the system and would allow the Russian government to ease into the regulation. The key factors to consider should mirror the Clean Water Act<sup>176</sup> and include the cost of applying the technology to the benefits received, the age of the equipment involved, engineering methods, and environmental impact.<sup>177</sup>

Because of the cost prohibitiveness of most procedures, the level of BPT for Russian nuclear-waste level would be low. The main regulatory scheme likely would consist of record-keeping requirements, studies of current procedures,<sup>178</sup> and the creation of a general oversight and inspection regime. However, these are all essential elements of a nuclear waste regulatory scheme approved under the IAEA's formulation.<sup>179</sup> It is unlikely, given the current complete lack of Russian control over its nuclear waste stream, that dumping at sea would cease. Environmentalists and other nations will continue to pressure Russia to stop such dumping.<sup>180</sup> Nevertheless, the international community must recognize that building a nuclear waste regulatory scheme after a country is already burdened with such wastes is an onerous task. As long as the Russian government maintains its technology-forcing plan, Western governments should adopt a supportive stance.

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174. Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387, 1311(b)(E) (1988) [hereinafter FWPCA].

175. 33 U.S.C. § 1311(d).

176. 33 U.S.C. § 1314(b)(1)(B).

177. 33 U.S.C. § 1314(b)(1)(B).

178. Park, *Requirements for Radioactive Waste Management in the Ocean*, in 3 RADIOACTIVE WASTES AND THE OCEAN, *supra* note 85, at 481, 502. The importance of studies in these circumstances cannot be understated. "The intelligent and safe use of practical waste space will require both scientific knowledge of the environment and technical understanding of the wastes."

179. TRANSBOUNDARY HAZARDOUS WASTES, *supra* note 165, at 378.

180. See, GREENPEACE POSITION REGARDING DUMPED REACTORS, GREENPEACE (March 1993) (on file with author).

The BPT plan also should include methods for dealing with sunken nuclear submarines outside Russia's territory. Here the application of BPT necessarily will be on a site-specific basis. The Russian government already has undertaken extensive study of the submarine *Komsomolets*.<sup>181</sup> It is unclear whether equally extensive surveys of wreckage have been conducted for the other submarines lost at sea. Therefore, application of BPT to these submarines may entail information-gathering expeditions and coordination with other countries if Russia decides to apply its laws extraterritorially. At this stage, it is unlikely that sealing the vessels or salvaging the submarines would be financially feasible; therefore, the sunken submarines would remain in situ pending the step to the next technology level.

## 2. Best Available Technology

Once the Russians achieved BPT, their control technology should jump to Best Available Technology (BAT). BAT reflects a weighing of the same factors as under BPT<sup>182</sup> except no direct cost-benefit analysis is conducted. Instead, cost is one of the factors entered into the mix and is no longer the overriding consideration.<sup>183</sup> The Russians at this stage could be utilizing the Pacific Fleet's hold-construction strategy to reduce both costs to the government and the number of people exposed to radiation.<sup>184</sup> Again, due to Russia's severe financial difficulties, it is doubtful that a total ban on nuclear-waste dumping could be enacted at this level of technology. Russia could, however, conform its dumping to IAEA standards, which it presently does not do. Under the IAEA guidelines, disposal at sea of low- and medium-level radioactive waste is limited to specially delimited areas that lie 200 miles offshore in waters deeper than 4,000 meters and are between fifty degrees North and fifty degrees South.<sup>185</sup> It is not likely that Russia could afford more extensive treatment for its lost submarines. However, at the BAT stage, Russia would be constructing a nuclear waste treatment and storage facility. The BAT technology level would require Russia to build on its BPT record-keeping and studies by enacting controls to ensure the site is built properly and management plans are in place. This would ensure that when the nuclear storage

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181. Polmar, *supra* note 77, at 77.

182. FWPCA, *supra* note 174, at 33 U.S.C. § 1314(b)(2)(B).

183. *Id.* See, e.g. the language of the Clean Water Act, *infra* note 186, regarding BPT ("total cost of application of technology in relation to the effluent reduction benefits") as compared with the factors to consider with BAT ("the cost of achieving such effluent reduction.") FWPCA, *supra* note 174, at 33 U.S.C. §§ 1314(b)(1)(B) and 1314(b)(2)(B).

184. Once the boats are dismantled and their nuclear fuel holds constructed, there is no need for an on-board crew. They would be dismissed and the supervisors of the nuclear-waste storage facility would assume responsibility for monitoring.

185. FACTS AND PROBLEMS, *supra* note 20, at fig. 1.

facility comes on-line in the year 2000 there is a complete plan for its operation and the movement to Lowest Achievable Emission Rate.

### 3. Lowest Achievable Emission Rate

By the time the Russians have a new nuclear treatment and storage facility available in the year 2000, the regulatory scheme should be ratcheted up to Lowest Achievable Emission Rate (LAER). Under the U.S. Clean Air Act, LAER is "the most stringent emission limitation which is achieved in practice . . . ."<sup>186</sup> At this point, Russia should have a full program in place (which it developed through its application of BPT and BAT) for the decommissioning of nuclear submarines. If storage and treatment plans are carried through, Russia will be able to abide by its London Convention obligations and be able to cease any low level radioactive waste disposal at sea. In addition, it should be able to conform to IAEA guidelines for nuclear treatment and disposal facilities. It is under LAER that the Russian government would become a responsible nuclear power.

The success of such a regulatory scheme depends heavily on bureaucrats whose track records currently are shabby. "[M]any of the old bureaucratic structures remain . . . . [t]hese old structures pose substantial challenges to environmental protection reforms . . . ."<sup>187</sup> These officials and their institutions will require that reformers use their political will to ensure that regulatory schemes are meaningful. Russia already has taken steps to consolidate what had been overlapping administrative agencies by creating in 1992 a Ministry of Ecology and Natural Resources.<sup>188</sup> As Russian leaders face re-organization and regulation of nuclear activities, they should focus on what is most appropriate for their country and not what Western countries would like to see. As it is, none of the former Eastern European countries can meet all of the European Community environmental standards.<sup>189</sup> A BPT to BAT to LAER approach will ensure that Russia evolves toward the safest and most internationally acceptable nuclear waste regulatory scheme. That program alone, however, is insufficient without the will to enforce. As a result, Russia's move toward the privatization of land should help.

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186. Clean Air Act, 42 U.S.C. §§ 7401-7671q, 7501(3)(B) (1988 and Supp. II 1990).

187. Bowman & Hunter, *supra* note 127, at 973.

188. Maloney-Dunn, *supra* note 15, at 416-17.

189. Bowman & Hunter, *supra* note 127, at 970.

*C. The Use of Land Values to Foster Better Environmental Decisions*

Under the Soviet system, the government held all land.<sup>190</sup> For nearly 75 years, individuals did not own land. When the USSR collapsed, Russia adopted land values similar to those of the United States. Today, Russia's constitution provides for private ownership of land.<sup>191</sup> It states that "[d]wellings are inviolable."<sup>192</sup> Individuals can "freely possess, utilize and dispose of land and other natural resources provided that this does not damage the environment and does not violate the rights and legitimate interests of others."<sup>193</sup> Furthermore, Russians are entitled to money damages when the state damages their property unlawfully.<sup>194</sup> The adoption of Western land values, where socialist ideas had taken root, has led to some discontent. The new Russian land system has de-emphasized the agrarian lifestyle in favor a free-market approach. "A weakening desire to work the land is a great danger to the national character," says Aleksandr Solzhenitsyn. "Among our people, the peasant sensibility has been trod underfoot . . ."<sup>195</sup> Reaction to the system illustrates the strong, long-cultivated connection between Russia's land and its people. Yet the new land ownership law offers "a relatively low-transaction-cost method of inducing people to 'do the right thing' with the earth's surface."<sup>196</sup> It is this attitude among private landowners that could be useful in insuring Russia takes steps to control its nuclear waste.

One of the chief advantages private ownership offers over group ownership is the motivation among individual land owners to police their land.<sup>197</sup> Under the old Soviet regime, private individuals had no recourse when the government harmed the environment. Now, however, individuals have an incentive to seek money from the government when it harms private property. Not only is the environment harmed, but their land is injured — property which when sold or passed down to future generations benefits the owner. These owners have a personal stake in their land. The government no longer has

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190. USSR CONST., art. 10. ("The basis for the economic system of the USSR is socialist ownership of the means of production in the form of state property (belonging to the people), and collective-farm and cooperative property").

191. RUSSIAN FEDERATION CONST., art. 9 ("The land and other natural resources are utilized and protected in the Russian Federation as the basis of the life and activity of the peoples inhabiting the corresponding territory. The land and other natural resources can be in private, state, municipal or other forms of ownership").

192. *Id.* at art. 25.

193. *Id.* at art. 36.

194. *Id.* at art. 53.

195. ALEKSANDR I. SOLZHENITSYN, *REBUILDING RUSSIA: REFLECTIONS AND TENTATIVE PROPOSALS* 30 (1991).

196. Robert C. Ellickson, *Property in Land*, 102 YALE L.J. 1315, 1327 (1993).

197. *Id.* at 1328 (The author notes that a "sole owner bears the entirety of any loss stemming from his slack oversight, whereas a group member bears only a fraction.").



the unfettered right to maltreat one's land. Damage inflicted on private property from nuclear-powered devices could run into the billions of rubles, creating a strong incentive for the government to adopt safer practices. There is doubt, however, whether the Russian government will have money to pay such damages.<sup>198</sup> Even so, the pressure private landowners can exert on governmental agencies can be considerable. As information about contamination in Russia has spread, more environmental activist groups have arisen, due to looser government regulation.<sup>199</sup> These groups already have prevented some nuclear-waste dumping.<sup>200</sup>

Further progress in using land ownership as a means of providing pressure for better environmental practices depends on more widespread acceptance of the notion of private land. This concept is completely new to Russia, and should be adopted cautiously. Russian leaders must develop their own concept of private ownership which melds both the agrarian values and the new entrepreneurial spirit. Western countries must remember that their own land values come from centuries of development. As Russians find their own way with land ownership, government also must develop and encourage individuals to exercise the rights of land ownership. When combined with newly created rights of speech<sup>201</sup> and assembly,<sup>202</sup> private ownership rights can help insure that government practices are protective of the environment. While this benefits the ocean only indirectly, since no one owns a plot of the sea, it nonetheless is crucial to the development of Russian ecological law.<sup>203</sup> Without private ownership generating pressure on the government both monetarily, politically, and collectively with other interest groups, Russia would have no reason to change its nuclear waste practices from within. International pressure is less useful than internal demand for change. One way for Russia to find supporters for its economic policies is to build constitu-

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198. Larisa Krasavchikova, *Comments on the Law on Property in the Russian Soviet Federated Socialist Republic*, 24 ST. MARY'S L.J. 481, 493 (1993) (The author notes that allowing takings-type claims may be more of a political move than one based on "well-founded regulations of ownership.").

199. Maloney-Dunn, *supra* note 15, at 416.

200. *Id.*

201. RUSSIAN FEDERATION CONST., art. 29, cl. 1 ("Each person is guaranteed freedom of thought and speech.")

202. *Id.* at art. 30, cl. 1 ("Each person has the right of association, including the right to create trade unions to protect his interests. The freedom of the activity of public association is guaranteed.")

203. Russia has recognized this and implemented the concept of group participation in ecological matters into the RSFSR LAW ON ENVIRONMENTAL PROTECTION, *supra* note 118, at art. 13 ("Environmental associations and other public associations which perform environmental functions have a right . . . to organize meetings, rallies, picket lines, marches, demonstrations and petition drives and gather signatures, and to make proposals regarding discussion of projects and referendums.").

encies based on a strong environmental policy. This would allow the government to spend its precious administrative capacity more efficiently. A strong environmental policy means the adoption of a progressive program to halt the disposal of nuclear waste at sea.

## V. CONCLUSION

The collapse of the Soviet Union has not been easy on the Russian people. They bear the brunt of a dangerous Cold War legacy. Nuclear waste from the days of military expansion haunts their safety and ability to live in a prosperous economy. It clogs their government, preventing an easier transition to non-military production. And it embarrasses them internationally. Yet the tools are there for a program, which if adopted and vigorously enforced, could free Russia from many of these atomic burdens.

First, Western governments should adopt a more extensive system of environmental assessments tied to their lending. The creation of information centers where Russians could obtain information about proposed projects, alternatives, and environmental impacts would empower citizens by giving them knowledge. Decades of environmental damage have been inflicted in the war with the West; the countries that won now have the opportunity to make that damage clear and give Russians the information they value in their own societies.

Next, the Russian government should create a technology-based regulatory scheme which constantly ratchets up the controls on emissions of radioactive waste. Beginning with a basic Best Practicable Technology scheme, Russia will acquire the information and record-keeping systems needed to build a stricter nuclear waste management program. At the Best Available Technology level, Russia can advance to a better level of nuclear waste management than now present, even if nuclear waste dumping at sea is not totally stopped. When its new storage and treatment facility is ready, Russia can move to the Lowest Achievable Emissions Rate and into the accepted norms within the international community for nuclear waste control. This BPT/BAT/LAER program is a gradual easing of control over the system where none existed before. It contemplates Russia's sensitive economic situation, but yields a result that ultimately is more protective of the environment.

Insuring that Russia follows its plans for environmental control requires pressure from people. Russia's new land owners, with their right to compensation for takings, are the ideal group to accomplish this goal. Whether government is moved by concerns about paying for private property claims or by pure political pressure from a group, Russia's leaders will have to deal with them by generating a more responsive, efficient environmental program. This program, if success-

ful, could result in constituencies for Russian leaders to draw upon when enacting other reform measures.

All waste is transboundary waste. Matter disposed of at sea or on land on the other side of the globe will find its way into the ecological cycle. Russia's dumping practices of the past have not borne this in mind. Yet Russia's nuclear-waste problems are not without solutions. Even if the West were to write a check tomorrow for the construction of nuclear waste facilities, Russia still would face the lack of a comprehensive system to ensure that the same difficulty does not occur again. Simple changes in the West's loan procedures, the implementation of a new technology-based regulatory scheme, and further land reforms would help guarantee that some responsible system develops. It is only with such a system that Russia can kill off the ecological ghosts which threatened the nation's and the oceans' livelihood.